Patent Claims

1. Method for compensating thermal optical effects in the beam path of an arrangement containing optical components, **characterized in** that optical elements **(13a, 13b, 16; 30a-30d, 41a-41c/39; 50a, 50b, 51; 67a-d, 72)** having at least two different material properties are used in cooperation in the beam path for the purpose of optical compensation, and heating by means of radiation absorption, thermal conduction in order to generate a power-dependent temperature distribution, and thermal dispersion in order to generate a thermal lens are distributed for the purpose of compensation over the different elements **(13a, 13b, 16; 30a-30d, 41a-41c/39; 50a, 50b, 51; 67a-d, 72)**.

2. Method according to Claim 1, **characterized in** that one of the optical elements **(13a, 13b, 16; 30a-30d, 41a-41c/39; 50a, 50b, 51; 67a-d, 72)** is brought as optically transparent compensation medium **(16; 39; 51; 72)** in the beam path **(14; 43; 61, 69)** on both sides into mechanical contact with a likewise optically transparent solid body **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)** as a further element, and the further element **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)** has a prescribed radiation absorption, the radial heating pattern being imprinted by the mechanical contact with the compensation medium **(16; 39; 51; 72)** for compensating thermal optical effects in the other optical components **(5, 7a, 7b; 30a-30d; 50a, 50b; 67a-d)** and/or the adjacent solid bodies **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)**.

3. Method according to Claim 2, in particular for compensating thermal optical effects in a laser resonator, **characterized in** that the further element has a prescribed absorption for the laser

radiation in the beam path, preferably for the pumping optical radiation, and in a preferred way the compensation medium **(16; 39; 51; 72)** and the adjacent solid bodies **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)** are cooled to the same temperature at their periphery, preferably in an encompassing fashion, in particular at the same radial distance from the axis **(14; 43; 61, 69)** of the beam path.

4. Optical unit **(9; 34a-34c; 49; 71a-c)**, which can be brought into the beam path **(14; 43; 61; 69)** of an optical arrangement **(1; 29; 47, 70)**, for compensating thermal optical effects of optical components **(5, 7a, 7b; 30a-30d; 50a, 50b; 67a-d)**, present in the beam path of the arrangement, for carrying out the method according to one of Claims 1 to 3, **characterized by** optical elements **(13a, 13b, 16; 30a-30d, 41a-41c; 50a, 50b, 51; 72)**, which have at least two different material properties and cooperate effectively for the compensation, in the beam path, and over which elements there can be distributed, preferably with a different effect **(13a, 13b, 16; 30a-30d, 39; 50a, 50b, 51; 72)**, for the purpose of compensation, heating by means of radiation absorption, thermal conduction for generating a power-dependent temperature distribution, and thermal dispersion for generating a thermal lens.

5. Optical unit according to Claim 4, **characterized in** that one of the elements has an optical compensation space **(15; 41a-41c; 49; 71a-c)** which is filled, in particular completely filled, with an optically transparent compensation medium **(16; 39; 51; 72)**, and optically transparent solid bodies, **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)** arranged on both sides of the compensation space **(15, 41a-41c)**, as further element with radiation absorption, with which solid bodies the

compensation medium **(16; 39; 51, 72)** has such a close thermal contact that good heat transfer from the solid bodies **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)** to the compensation medium **(16; 39; 51; 72)** is ensured.

6. Optical unit **(9; 34a-34c; 49; 71a-c)** according to Claim 5, **characterized in** that the compensation space **(15; 41a-41c)** extends perpendicular to the optical axis **(14; 43)** of the beam path, in particular in a formation which is radially symmetric relative to the axis of the beam path.

7. Optical unit **(9; 34a-34c; 49; 71a-c)** according to Claim 5 or 6, **characterized in** that the radial extent of the compensation space **(15; 41a-c)** relative to the optical axis **(14; 43; 61, 69)** of the beam path is adapted to, preferably being selected to be identical to, that of the neighboring solid bodies **(13a, 13b; 30a-30d; 50a, 50b; 67a-d)**.

8. Optical unit **(9; 34a-34c)** according to one of Claims 5 to 7, **characterized in** that the solid bodies **(13a, 13b; 30a-30d)** immediately neighboring the compensation medium **(16; 39)** are held with the aid of a cooling holder **(17; 35)** which preferably completely encompasses the entire envelope of the solid body **(13a, 13b; 30a-30d)** in intimate thermal contact.

9. Optical unit **(9; 34a-34c)** according to one of Claims 5 to 8, **characterized by** a material, which transmits no mechanical shear forces, as compensation medium and an expansion space **(19)** which is connected to the compensation space **(15; 41a-41c)** into which the compensation medium **(16; 39)** can undertake volumetric equalization in the event of thermal loading.

10. Optical arrangement **(29; 47; 70)** with an optical unit **(9; 34a-34c; 49; 71a-c)** according to one of Claims 3 to 9 for generating or amplifying radiation, having at least one optically active medium **(30a-30d; 50a, 50b; 67a-d)**, **characterized in** that the active medium is subdivided into partial media **(30a-d; 50a, 50b; 67a-d)**, a compensation space **(41a-41c)** filled with a compensation medium **(39; 51, 72)** is arranged as an optical element between the partial media **(30a-30d; 50a, 50b; 67a-d)** and as a further optical element of the optical unit **(34a-34c; 49; 71a-c)**, and each partial medium **(30a-30d; 50a, 50b; 67a-d)** acts as an optically transparent solid body of the unit **(34a-34c, 49; 71a-c)**.

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